

CLAIMS

What is claimed is:

1. A method for controlling a lens group having a focus lens and a zoom lens group along an optical axis, where the zoom lens group includes at least one zoom lens, comprising:
5 receiving input to change the position of a selected one of the focus lens and the zoom lens group; and
separately controlling the positions of the focus lens and the zoom lens group along the optical axis such that the focus lens and the zoom lens
10 approach no closer to one another than a selected minimum safe distance, for any selected magnification provided by the zoom lens group and the focus lens.
2. The method of claim 1, wherein said receiving comprises receiving input to change the position of the focus lens.
- 15 3. The method of claim 2, wherein said separately controlling comprises determining the initial position of the at least one zoom lens.
4. The method of claim 3, wherein said separately controlling comprises determining a permissible working range.
5. The method of claim 4, further comprising moving the focus lens to the
20 best focus position within said permissible working range.
6. The method of claim 5, wherein said moving the focus lens to the best focus position within said permissible working range comprises:
selecting a focus figure of merit;
moving the focus lens in one direction along the optical axis;
25 tracking the position of the focus lens along the optical axis;
if the focus figure of merit increases, moving the focus lens again in said one direction to a final position that is no further than a boundary of said permissible working range; and

if the focus figure of merit decreases, moving the focus lens again in a direction opposite said one direction to a final position that is no further than a boundary of said permissible working range.

5 7. The method of claim 6, wherein said final position substantially corresponds to a position on the optical axis where a peak value of said focus figure of merit is reached.

8. The method of claim 6, wherein said final position is a boundary of said permissible working range.

10 9. The method of claim 1, wherein said receiving comprises receiving input to change the position of the zoom lens group.

10. The method of claim 9, wherein said separately controlling comprises determining the initial position of the focus lens and the focal distance associated with said initial position.

15 11. The method of claim 9, wherein said separately controlling comprises determining the initial position of at least one zoom lens.

12. The method of claim 11, further comprising moving at least one zoom lens a discrete amount along the optical axis to a new position in the direction associated with said received input.

20 13. The method of claim 12, further comprising:
determining a permissible working range along the optical axis; and
moving the focus lens to the best focus position within said permissible working range, wherein the best focus position within said permissible working range achieves focus for said initial focal distance at said new position of said at least one zoom lens.

25 14. The method of claim 13, further comprising repeating said moving the zoom lens, said determining a permissible working range, and said moving the focus lens until at least one zoom lens has reached a final position associated with said received input.

15. The method of claim 1, wherein said receiving comprises receiving input to move the lens group to a power-off position.

16. The method of claim 15, wherein said separately controlling comprises:

5 moving the focus lens to a home position; and
moving the zoom lens group such that the second zoom lens moves to a
second zoom lens retracted position, said moving the zoom lens group
performed after said moving the focus lens, wherein said second zoom
lens retracted position is substantially at a minimum safe distance from
10 the home position along the optical axis.

17. A method for controlling a lens group having a focus lens and a zoom lens group along an optical axis, where the zoom lens group has a first zoom lens and a second zoom lens, comprising:

receiving input to change the position of the zoom lens group;
15 determining the initial position of the focus lens and the focal distance
associated with said initial position;
determining the initial position of the second zoom lens;
moving the second zoom lens a discrete amount along the optical axis to a new
position in the direction associated with said step of receiving input;
20 determining a permissible working range along the optical axis;
for each selected magnification of the zoom lens group and focus lens, moving
the focus lens to the best focus position within said permissible
working range, wherein the best focus position within said permissible
working range achieves focus at said new position of said second zoom
25 lens; and
repeating said moving the second zoom lens, said determining a permissible
working range and said moving the focus lens until the second zoom
lens has reached a final position associated with said step of receiving
input.